

# **NOTICE**

**All drawings located at the end of the document.**

INFORMATION  
ONLY

RF/ER-95-0009



ROCKY FLATS

**Final Technical Memorandum No. 10  
Soil Sampling Plan  
Surface Disturbance Areas  
Operable Unit No.5**



**March 1993**

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**TECHNICAL MEMORANDUM NO. 10**

**ADDENDUM TO FINAL PHASE I  
RFI/RI WORK PLAN**

Soil Sampling Plan -- Surface Disturbance Areas

Rocky Flats Plant  
Woman Creek Priority Drainage

(Operable Unit No. 5)

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RFI/RI WORK PLAN TECHNICAL MEMORANDUM  
APPROVAL SHEET

EG&G ROCKY FLATS PLANT

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Addendum to Final Phase I, RFI/RI Work Plan  
Soil Sampling Plan - Surface Disturbance Areas  
Rocky Flats Plant  
Worman Creek Priority Drainage

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EG&G ROCKY FLATS PLANT  
RFI/RI Work Plan for OU5

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Date

FINAL TECHNICAL MEMORANDUM 10  
SOIL SAMPLING PLAN - SURFACE DISTURBANCE AREAS  
(IHSS 209, SURFACE DISTURBANCE WEST OF IHSS 209, AND  
SURFACE DISTURBANCE SOUTH OF IHSS 133)

## 1.0 INTRODUCTION

### 1.1 BACKGROUND

Soil boreholes are proposed as part of the Phase I RCRA Facility Investigation/Remedial Investigation (RFI/RI) of Operable Unit No. 5 (OU5) in the areas of Individual Hazardous Substance Site (IHSS) 209, the surface disturbance west of IHSS 209, and the surface disturbance south of IHSS 133 group to characterize subsurface materials and to assess if subsurface contamination is present.

The locations of the disturbed areas within OU5 are shown on Figures 1 and 2. Within these areas the OU5 RFI/RI Work Plan (U.S. DOE, 1992) identified seven former excavations and two additional areas that required investigation. As shown on Figures 1 and 2, the number and location of former excavations, pits, and disturbed ground has been revised based on an aerial photograph review and a site reconnaissance resulting from Stages 1 and 2 RFI/RI activities (see Section 2.1).

The history of the former excavations and pits is unknown, therefore the OU5 RFI/RI Work Plan had proposed the installation of 19 soil boreholes to investigate the potential for subsurface contamination. Based on the results of the Stages 1 and 2 activities of the OU5 RFI/RI, the number and location of soil boreholes has been revised.

Additionally, a soil borehole that was drilled during the Site Wide program has been identified within IHSS 209 (Figure 1). This borehole (borehole # 41191) was advanced to a total depth of 223.1 feet below ground surface. Alluvium was recorded to a depth of 31.3 feet which was underlain by claystone. During the installation of this borehole six-foot composite samples were collected for analysis of TAL metals and radionuclides, and two-foot discrete samples were collected for analysis of volatile organic compounds. The results of these analyses indicated that manganese was detected at concentrations of 1,280 Mg/Kg and 665 Mg/Kg (upper tolerance limit is 643 Mg/Kg) from depths of 24 ft. - 29.8 ft. and 29.8 ft. - 35.6 ft., respectively, iron was detected at a concentration of 33,700 Mg/Kg (upper tolerance limit is 33,287 Mg/Kg) from a depth of 29.8 ft. - 35.6 ft., and tritium was detected at a concentration of 670 pCi/l (upper tolerance limit is 411 pCi/l) from a depth of 24 ft. - 29.8 ft. Manganese and iron are naturally occurring elements, and are not considered to be out of normal ranges at these concentrations. No other inorganic constituents were detected in concentrations above the upper tolerance limits from this borehole.

Several volatile organic compounds (acetone, methylene chloride, and toluene) were detected in these samples, however, these constituents were detected sporadically and are all common laboratory contaminants. Other samples from this borehole with these "hits" were flagged in the Rocky Flats Environmental Data System (RFEDS) data base as being less than the detection limit, or as being in the laboratory blank. Based on the analytical results from borehole 41191, additional soil boreholes should not be required in this area.

## 1.2 PURPOSE AND SCOPE

This Technical Memorandum (TM) is intended to provide a revised soil boring program and surface soil sampling program for the surface disturbance areas. This TM incorporates the currently available information from Stage 1 of the OU5 RFI/RI Work Plan, the Inter-Agency Agreement (IAG), the February 1992 Phase I RFI/RI Work Plan for OU5 (U.S. DOE, 1992), and EG&G Standard Operating Procedures (SOPs).

This TM proposes the installation of 4 soil boreholes rather than the original proposed number of 19. The purpose of each borehole is to provide:

- continuous core samples for lithologic descriptions,
- discrete environmental samples from 2-foot intervals,
- composite environmental samples from 6-foot intervals, and
- 2-foot composite samples from the upper two feet for possible use in the ecological assessment.

Also, this TM proposes that groundwater samples be collected from one soil borehole per site if groundwater is encountered. The purpose of the water samples is to provide information on the presence of contamination in the groundwater beneath the disturbed areas.

To characterize the surface soils, this TM proposes to collect surface soil samples at each identified pit, former excavation, or pond, and at the Surface Disturbance South of IHSS 133. A total of 19 surface soil samples will be collected from these areas. In addition, surface soil samples will be collected at any areas of anomalous radiation readings or stained areas identified from a visual inspection and radiation survey.

## 2.0 PRELIMINARY FIELD WORK

Existing aerial photographs and oblique photographs were reviewed as part of Stage 1 of the RFI/RI for the surface disturbances. The aerial photographs used for this review were those contained in the AERIAL PHOTOGRAPHIC ANALYSIS COMPARISON REPORT, prepared by the U.S. Environmental Protection Agency (U.S.EPA) Environmental Monitoring Systems Laboratory in 1988 (U.S.EPA, 1988). The oblique photographs that were reviewed are photographs dated from 1969 to the late 1980s. The photographs were examined to assess the location and history of the surface disturbances. The results of this review are presented below.

In addition to the aerial photograph review, a field reconnaissance has been completed. Also, a fidler survey will be performed in accordance with Stage 2 of the work plan prior to implementation of the soil boring and surface soil sampling programs presented in this TM.

### 2.1 AERIAL PHOTOGRAPH REVIEW AND RECONNAISSANCE SURVEY

In accordance with Stage 1 of the Work Plan, a review of the vertical aerial photographs and oblique photographs covering sites IHSS 209 and the two other surface disturbance areas was completed on September 23, 1992. These activities were followed by a reconnaissance field survey of these areas in accordance with Stage 2 of the Work Plan. The objective of the field survey was to confirm the locations of pits or other features within each area, and to determine if any debris or staining is present that would indicate that the areas had been used for the disposal of RFP waste materials. The results of the aerial photograph review and the reconnaissance survey for each area are summarized in the following text.

#### 2.1.1 Site IHSS 209

Site 209 consists of disturbed ground, as shown on Figure 1, that extends from the southwest to the northeast for a distance of approximately 1200 feet and two ponds. The vertical photographs

indicate that the vegetation and upper sediments had been striped from the area prior to 1955, and that prior to 1964 several pits had been opened within the site. The review of the photographs subsequently resulted in an extension of the overall length of the IHSS as compared to the dimensions shown on Figure 2-7 of the OU5 Work Plan, and some adjustments to the locations of the pits that were also shown on Figure 2-7. The two pond sites were added to Figure 1 as a result of Stage 1 activities.

The Stage 2 field reconnaissance confirmed the overall reconfiguration of the site, resulting from Stage 1 activities, and that no significant debris or staining was found to indicate that any waste disposal had occurred. It appears that the largest disturbance on the northeast end of the area, may have been used as a source of gravel prior to 1955.

The pond, shown on Figure 1, to the southwest of the road is first visible on the 1980 photograph. As a result of Stage 2 reconnaissance this pond was found to be at least ten feet in depth and dry. The pond, shown on Figure 1, on the northeast end of the site occurs at the base of a hill and is first visible on the 1955 aerial photograph. The northeast pond was bisected by a road prior to 1964, and currently appears to be a seepage area with abundant vegetation.

The pits shown throughout the area are small, shallow excavations that are still open or only partially backfilled. There is no evidence that these pits were ever used for the disposal of waste materials.

#### 2.1.2 Surface Disturbance West of IHSS 209

The area to the west of IHSS 209 consists of eight pits that are first visible on the 1955 vertical aerial photograph of the RFP area. The Stage 1 aerial photo review resulted in relocating the pits approximately 250 feet to the north with respect to the locations shown on Figure 2-7 of the OU5 Work Plan. Three additional pits were identified as a result of Stage 1 activities and confirmed during the Stage 2 field reconnaissance.

The Stage 2 field reconnaissance confirmed the locations of all eight pits identified on the 1955 aerial photograph (Figure 1). The largest pit is located near the center of the site and was found to be several feet deep. The largest pit is currently dry but has obviously held water during periods of wet weather or snow melt, and is now the host for a fairly large cottonwood tree indicating that the sight has been open for a long period of time. The remaining pits are small and shallow, appear to be capable of holding water during wet weather, and are heavily re-vegetated. There is no indication that any of these pits had ever been used as disposal sites.

### 2.1.3 Surface Disturbance South of IHSS 133

The area to the south of the IHSS 133 group is shown on Figure 2 and consists of an area of disturbed ground, and an area that contains two open and two reclaimed pits. The area containing the disturbed ground comprises the southwest end of the site and is approximately 1,000 feet in length, and from 50 to 150 feet in width. The open and reclaimed pits are located in the northeast half of the site. The locations of the pits shown on Figure 2 have been corrected as a result of Stage 1 activities, according to scaled locations from the aerial photographs, and do not agree with the locations shown on Figure 2-6 of the OU5 Work Plan.

The field reconnaissance of the site confirmed the existence of the features that are noted in the Work Plan and identified on the aerial photographs. The disturbed area located in the southwest half of the site consists of cobble and small boulder size rocks of the Rocky Flats Alluvium, and appear to have been disturbed by some unknown surface activity. There is, however, no staining or debris associated with the site that would indicate any waste disposal had occurred.

The smaller pits shown on Figure 2 are both open. The pit shown on the southwest end of the site is a drainage ditch that diverts runoff water to the south, and shows no indications as having been used as a disposal site. The open pit shown on the northeast end of the site is approximately twenty feet in length, 2 to 3 feet deep, and shows no indications as having been

used as a disposal site. The northeast pit is located directly to the northeast of the current location of a radio relay transmitter.

The elongated ~~parallel~~ pits shown on Figure 2, were opened prior to 1978, and were apparently reclaimed soon after that time. The area was re-contoured and is now completely re-vegetated. There are no indications of debris or staining associated with these sites.

No evidence was found, as a result of the Stage 1 and 2 activities, to support the existence of the horseshoe shaped pit described in the OU5 Work Plan. Topographically this area of the site is an elongated northeast trending nose with moderately steep slopes defining the northeast end of the structure. The alluvial materials exposed along these slopes can account for the appearance of a pit or disturbed area on the aerial photographs; however, Stage 2 field reconnaissance did not substantiate the existence of a horseshoe shaped pit.

### 3.0 SOIL BORING PROGRAM

#### 3.1 PRELIMINARY GRID

Currently, the soil boring program (subsurface material sampling) is expected to investigate some of the former excavations and pits identified within the surface disturbance areas (as determined by the aerial photograph review and site reconnaissance). Since there is no visual evidence of waste disposal in these areas and historical evidence is unknown, the number of proposed soil boreholes has been decreased from 19 (as proposed in the OU5 RFI/RI Work Plan (U.S.DOE, 1992)) to a total of 4. These four boreholes should be sufficient to characterize subsurface materials and to assess if subsurface contamination is present. One borehole will be placed in the pit located on the northern edge of the Surface Disturbance West of IHSS 209 (Figure 1). Figure 2 shows that one borehole will be placed in each of the two former excavations that have been reclaimed and one additional borehole will be placed within disturbed ground southwest of the four excavations at the Surface Disturbance South of IHSS 133. In the event that contamination is detected in any of the above boreholes, additional boreholes will be proposed to assess the extent of the contamination in a subsequent version of this TM. Also, according to the OU5 RFI/RI Work Plan, if radiation anomalies are detected during the fidler survey, additional boreholes may be placed within these anomalies.

Site reconnaissance indicated the terrain to be steep on the northeastern sides of IHSS 209 and the Surface Disturbance South of IHSS 133. These steep slopes may make access to the proposed soil borehole locations difficult. Therefore, the proposed soil borehole locations may be adjusted to accommodate for field conditions. Borehole locations will be marked and cleared according to procedures outlined in SOP GT.10 - Borehole Clearing and surveyed according to procedures specified in SOP GT.17 - Land Surveying.

Boreholes will be drilled six feet into bedrock. Figures 1 and 2 show the proposed soil borehole locations. The drilling and soil sampling techniques that will be implemented during this drilling program are described in the following sections.

### 3.2 DRILLING AND SAMPLING PROCEDURES

Boreholes will be advanced to a total depth of six feet into bedrock following procedures in SOP GT.02 - Drilling and Sampling with Hollow-stem Augers. The drive sample method will be used to obtain soil samples at the surface disturbance areas unless conditions require that the continuous core method be used. Soil samples or core will be logged according to procedures outlined in SOP GT.01 - Logging of Alluvial and Bedrock Materials. Equipment, both sampling and drilling equipment will be decontaminated as specified in SOP FO.03 - General Equipment Decontamination and SOP FO.04 - Heavy Equipment Decontamination. Decontamination water and wash water and drilling cuttings will be handled according to the procedures outlined in SOP FO.07 - Handling of Decontamination Water and Wash Water, and SOP FO.08 - Handling of Drilling Fluids and Cuttings, respectively. Subsequent to required sampling activities as specified in the following paragraphs boreholes will be grouted according to procedures specified in SOP GT.05 - Plugging and Abandonment of Boreholes.

The following samples will be obtained from each borehole:

- continuous core samples for lithologic descriptions,
- a 2-foot composite sample from zero to two feet for possible use in the ecological assessment,
- discrete (a 3-inch liner) environmental samples of disturbed alluvium at 2-foot intervals for TCL volatile organic compound (VOC) analysis, and
- composite environmental samples of disturbed alluvium from 6-foot intervals for TCL semi-volatile organic compound, TAL metals, and total uranium, plutonium, americium, gross alpha, and gross beta analysis.

The first 6-foot composited interval (zero to six feet) will be collected and sampled. The sample will be sent to the contract laboratory for analysis. These samples will be sent to the contract laboratory following procedures specified in SOP FO.13 - Containerization, Preserving, Handling, and Shipping of Soil and Water Samples. After the first 6-foot composite, the field geologist will determine whether or not the alluvium below 6 feet is disturbed using features such as bedding or presence of man-made materials. If the material below 6 feet is determined to be undisturbed, the core will be logged and photographed but samples will not be sent for analysis. If the alluvium is determined to be disturbed, it will be sampled and sent to the contract laboratory for analysis as specified above.

Groundwater sample collection will be attempted from the boreholes at a frequency of one per site (i.e. a maximum of three samples), in the event that groundwater is encountered. These samples will be collected via the BAT® sampler, or equivalent (e.g. Hydropunch II). These samples will be sent to the contract laboratory following procedures specified in SOP FO.13 - Containerization, Preserving, Handling, and Shipping of Soil and Water Samples. The groundwater samples will be analyzed for the same analytes as the soil samples provided enough water is available. If the amount of groundwater is limited, the groundwater samples will be analyzed for TCL VOCs (requiring 3-40 ml samples), gross alpha and gross beta (requiring 550 ml), and TAL metals (requiring 1 L). Depending upon the amount of groundwater available, the priority in which the samples will be analyzed is TCL VOCs first, gross alpha and gross beta next, and TAL metals last.

Quality assurance/quality control (QA/QC) samples will also be collected to assure that the QA/QC procedures are followed according to the Quality Assurance Project Plan (QAPjP), the site-specific Quality Assurance Addendum (QAA), and the QC requirements presented in SOP FO.13.

Three soil samples (one from each of the disturbed areas, i.e., IHSS 209, the Surface Disturbance West of IHSS 209, and the Surface Disturbance South of IHSS 133) will be collected for

geotechnical analyses from a depth of 0 ft.- 2 ft., in accordance with the OU5 RFI/RI Work Plan. Samples that are collected for geotechnical testing will be analyzed for grain size and distribution utilizing a sieve and hydrometer. These samples will consist of approximately 3/4-filled pint-sized glass jars with airtight lids placed in compartmented shipping cartons designed to prevent breakage of the jars. Sample peeling, as described in SOP GT.2, is not required for geotechnical samples.

#### 4.0 SURFACE SOIL SAMPLING PROGRAM

The Work Plan proposed 19 surface soil samples be collected from the three sites to characterize surface soils. As a result of Stage 1 and 2 activities, 17, not 19, surface disturbances were located at the three sites. Based on this information, one surface soil sample will be collected at each identified pit, former excavation, or pond. In addition to these 17 locations, two surface soil samples will be collected from the southwestern portion of the Surface Disturbance South of IHSS 133. A total of 19 surface soil samples will be collected at or near the three disturbed areas (Figures 1 and 2). In addition, surface soil samples will be collected at any areas of anomalous radiation readings or stained areas identified from a visual inspection and radiation survey. Surface soil samples will be collected using methods describe in SOP GT.8. Specifically, the following sampling methodology hierarchy will be employed:

- At sampling locations of sufficient size, the 10-subsample, 2-square meter modified Rocky Flats method will be used;
- At sampling locations too small for the 10-subsample, 2-square meter method, the 5-subsample, 1-square meter method will be used; and
- Only at sampling locations of less than 1-square meter or too rocky to adequately obtain the requisite 5 or 10 samples, a "grab" sample will be collected.

Sampling equipment will be decontaminated as specified in SOP FO.03 - General Equipment Decontamination. Decontamination water and wash water will be handled according the procedures outlined in SOP FO.07 - Handling of Decontamination Water and Wash Water. Samples will be sent to the contract laboratory following procedures specified in SOP FO.13 - Containerization, Preserving, Handling, and Shipping of Soil and Water Samples. Surface soil samples will be analyzed for semi-volatile organic compounds (base neutral extractables), TAL metals, total organic carbon, TCL pesticides, total uranium ( $U^{233/234}$ ,  $U^{235}$ ,  $U^{238}$ ), plutonium ( $P^{239/240}$ ), americium ( $Am^{241}$ ), bulk density, particle size (using grain size sieve analysis), specific conductance, and pH.

## 5.0 DATA REDUCTION AND REPORTING

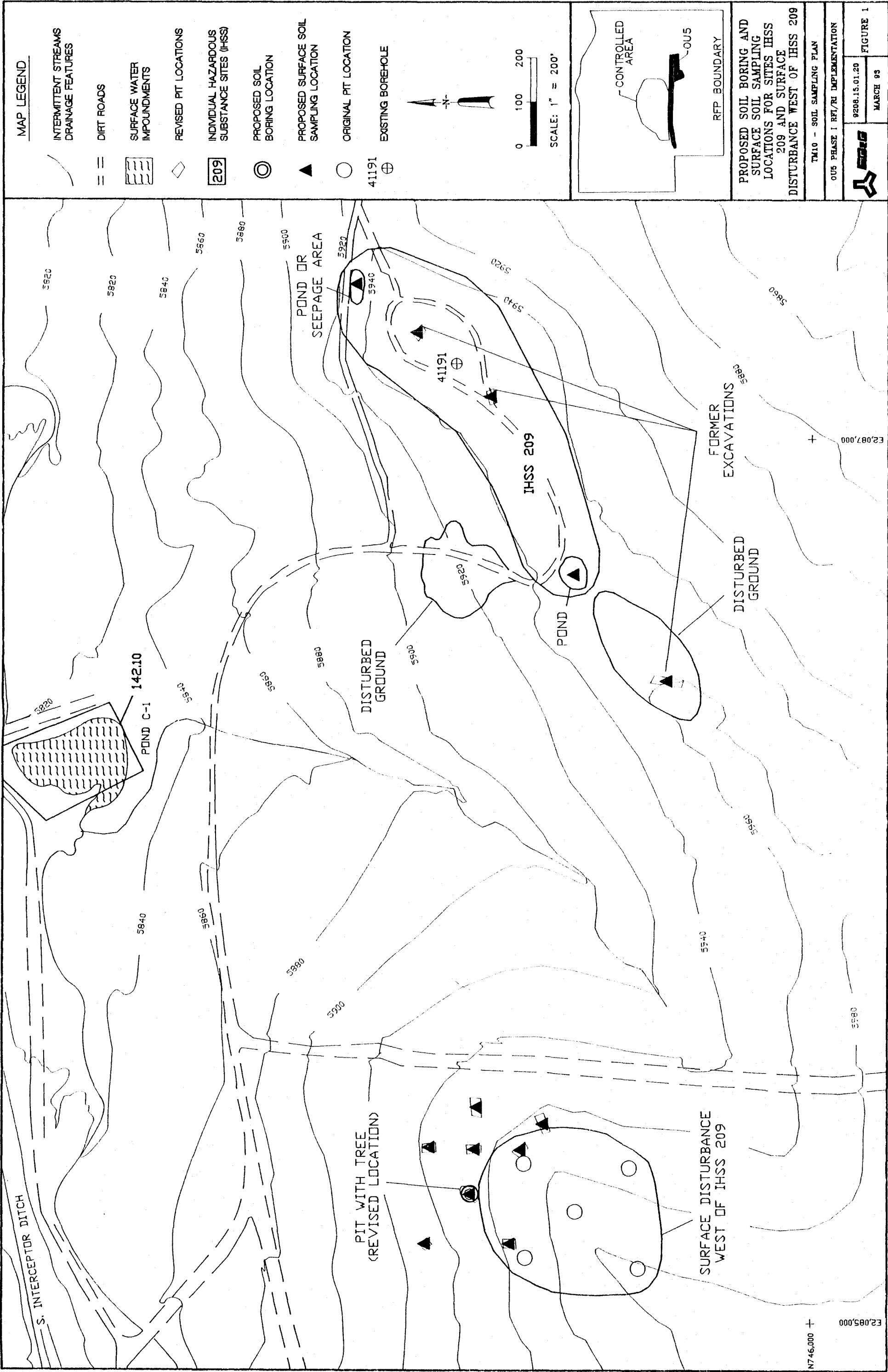
Prior to reporting data, data validation must be performed. Guidelines used to evaluate analytical data are referenced in subsection 3.4.2 of Section No. 3.0 of the QAPjP. The laboratory validation process is also illustrated in Figure 3-1 of Section No. 3.0 of the QAPjP. Field data validation will be performed as specified in subsection 3.4.2 of Section No. 3.0 of the QAPjP. The Data Quality Objectives (DQOs) for validating the OU5 measurement data are presented in the Phase I Work Plan for OU5 (U.S. DOE, 1992).

Reduction of field and laboratory data shall comply with SOP FO.14, Field Data Management, and the data reduction functions summarized in subsections 3.4.1 of Section No. 3.0 of the QAPjP. Laboratory data reduction will comply with the data deliverable requirements specified in the General Radiochemistry and Routine Analytical Services Protocol (GRRASP). Field data reduction shall be used in the data validation process to verify that the laboratory field controls and DQOs for measurement of data have been met.

Depending on the data validation process, data are flagged as either "valid", "acceptable with qualifications", or "rejected". The results of the data validation shall be reported in the EM Department Data Assessment Summary reports. The usability of data (the criteria of which is also described in subsection 3.3.7 of Section No. 3.0 of the QAPjP (EG&G, 1991)) shall also be addressed by the RI Project Manager.

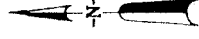
## 6.0 REFERENCES

- EG&G. 1991. Environmental Restoration Program (ERP) Quality Assurance Project Plan For CERCLA Remedial Investigations/Feasibility Studies and RCRA Facility Investigations/Corrective Measures Studies Activities, May 5, 1991.
- U.S. Department of Energy (U.S. DOE). 1992. Phase I RFI/RI Work Plan - Woman Creek Priority Drainage Operable Unit No. 5. Manual 21100-WP-OU 05.1. Vol. 1. February 1992.
- U.S. Environmental Protection Agency (U.S. EPA). 1988. Research and Development Aerial Photographic Analysis Comparison Report, Rocky Flats, Golden, Colorado. EPA Region VIII. TS-PIC-88760. July 1988.

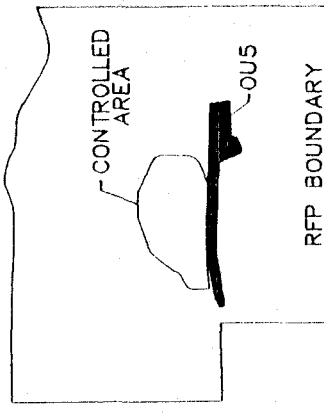


MAP LEGEND

- INTERMITTENT STREAMS DRAINAGE FEATURES
- DIRT ROADS
- SURFACE WATER IMPOUNDMENTS
- REVISED PIT LOCATIONS
- INDIVIDUAL HAZARDOUS SUBSTANCE SITES (IHSS)
- PROPOSED SOIL BORING LOCATION
- PROPOSED SURFACE SOIL SAMPLING LOCATION
- ORIGINAL PIT LOCATION
- EXISTING BOREHOLE



SCALE: 1" = 200'



PROPOSED SOIL BORING AND SURFACE SOIL SAMPLING LOCATIONS FOR SITES IHSS 209 AND SURFACE DISTURBANCE WEST OF IHSS 209

TM10 - SOIL SAMPLING PLAN

005 PHASE I RFI/RI IMPLEMENTATION

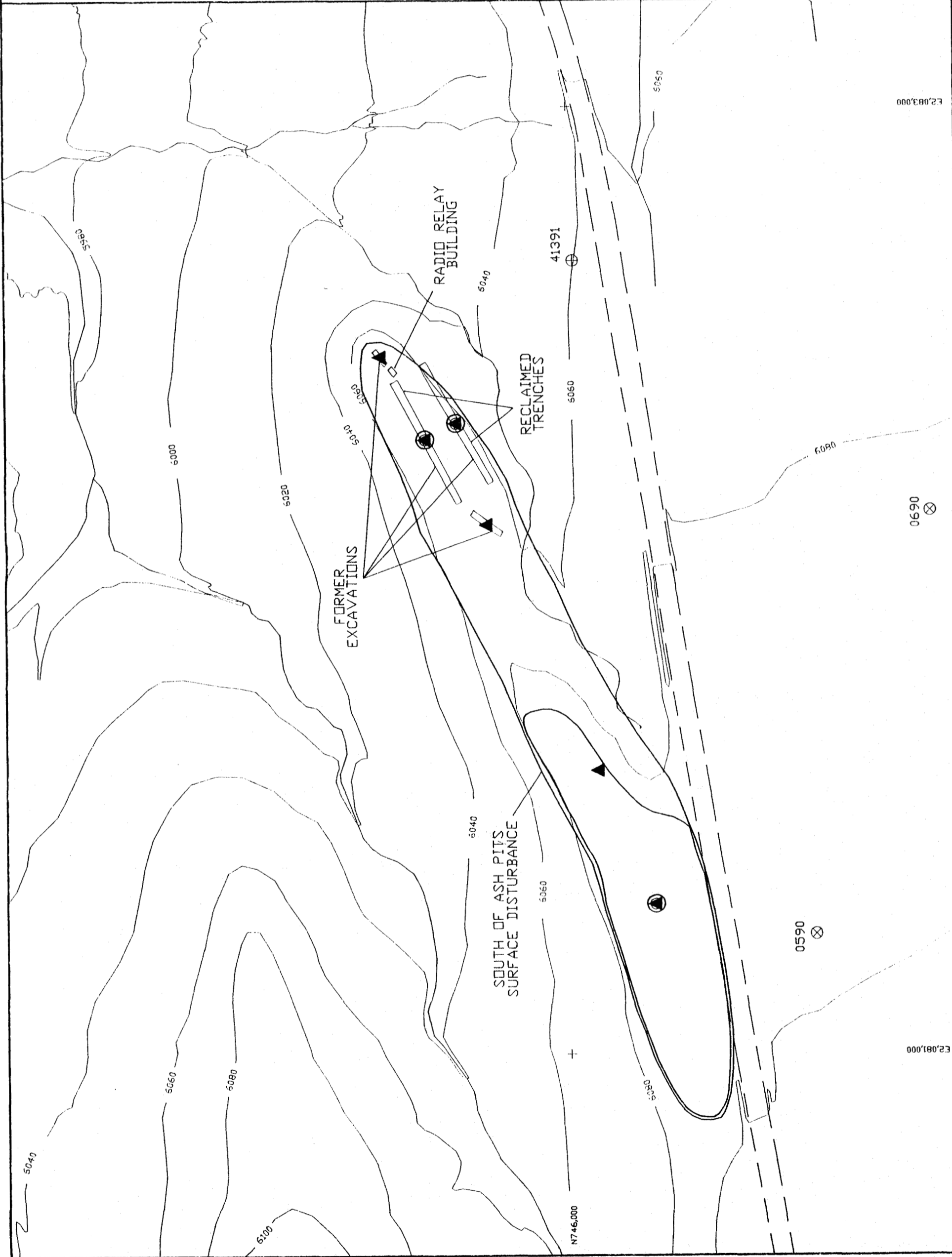


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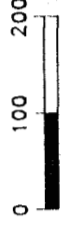
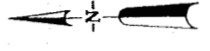
FIGURE 1

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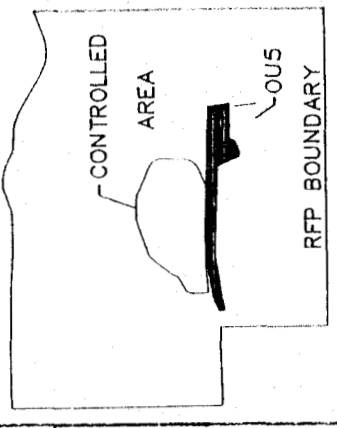


MAP LEGEND

- INTERMITTENT STREAMS DRAINAGE FEATURES
- DIRT ROADS
- SURFACE WATER IMPOUNDMENTS
- REVISED PIT LOCATIONS/ FORMER EXCAVATIONS
- INDIVIDUAL HAZARDOUS SUBSTANCE SITES (IHSS)
- PROPOSED SOIL BORING LOCATION
- PROPOSED SURFACE SOIL SAMPLING LOCATION
- EXISTING BOREHOLE
- EXISTING MONITORING WELLS



SCALE: 1" = 200'



PROPOSED SOIL BORING AND SURFACE SOIL SAMPLING LOCATIONS FOR SURFACE DISTURBANCE SOUTH OF IHSS 133

TM10 - SOIL SAMPLING PLAN	
OUS PHASE 1 RFI/RI IMPLEMENTATION	
9208.15.01.20	FIGURE 2
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